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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/658,639	09/09/2003	Han-Lim Lee	5000-1-433	4713

33942 7590 03/21/2007
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EXAMINER	
LIU, LI	
ART UNIT	**PAPER NUMBER**
2613	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/21/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)
	10/658,639	LEE ET AL.
	Examiner	Art Unit
	Li Liu	2613

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 January 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1 and 9-15 have been considered but are moot in view of the new ground(s) of rejection.

Claim Objections

2. Amended claims 5 and 19 are objected to because of the following informalities:

1). In amended claim 5, line 7, "pair of second **modulators**" should be changed to "pair of second **amplifiers**". It has been treated as such for the remainder of this Office action;

2). In amended claim 19, line 7, "pair of second **modulators**" should be changed to "pair of second **amplifiers**". It has been treated as such for the remainder of this Office action.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-4, 6, 8, 15-18 and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Ono et al (US 6,388,786).

1). With regard to claim 1, Ono et al discloses a duobinary optical transmission apparatus (Figures 8, 13 and 23, ABSTRACT) comprising:

a light source (Semiconductor Laser 1 in Figure 8, 13 and 23) for outputting an optical carrier;

a Non-Return to Zero (NRZ) optical signal generating section (Optical Intensity Modulator 2 in Figures 8, 13 and 23) configured to receive an NRZ electrical signal, and for modulating the optical carrier from the light source into an NRZ optical signal according to said NRZ electrical signal (column 7, line 3-30); and

a duobinary optical signal generating section (Optical Phase Modulator 3 in Figures 8, 13 and 23) configured to receive said NRZ electrical signal and modulating said NRZ optical signal into a duobinary optical signal (column 7, line 10-30).

2). With regard to claim 2, Ono et al further discloses wherein the light source comprises a laser diode (Semiconductor Laser 1 in Figure 8, 13 and 23).

3). With regard to claim 3, Ono et al further discloses wherein the NRZ optical signal generating section comprises a pair of first modulator driving amplifiers (Driving amplifiers 21 in Figure 15) for amplifying and outputting the NRZ electrical signal, and a first interferometer type optical intensity modulator (Optical Intensity Modulator in Figures 8, 13, 15 and 23) for modulating an intensity of said optical carrier according to driving signals inputted from said pair of first modulator driving amplifiers.

4). With regard to claim 4, Ono et al further discloses wherein said first interferometer type optical intensity modulator comprises a Mach-Zehnder interference

type optical phase modulator (Mach-Zehnder (MZ) Optical Intensity Modulator, column 7 line 4-5).

5). With regard to claim 6, Ono et al further discloses wherein the NRZ optical signal generating section (Optical Intensity Modulator 2 in Figures 8, 13 and 23) is adapted for receiving the NRZ electrical signal from a pulse pattern generator (column 7, line 8-10).

6). With regard to claim 8, Ono et al further discloses wherein the adaption of the NRZ optical signal generating section to receive the NRZ electrical signal does not require low pass electrical filters (Ono's duobinary system, such as shown in Figures 8, 13 and 23, has no low pass electrical filters, BACKGROUND OF INVENTION).

7). With regard to claim 15, Ono et al discloses a method for duobinary optical transmission comprising the steps of:

(a) outputting a light source as an optical carrier (Semiconductor Laser 1 outputs a light source, Figure 8, 13 and 23);

(b) receiving an NRZ electrical signal (Optical Intensity Modulator 2 receives an NRZ electrical signal, Figures 8, 13 and 23) and modulating the optical carrier from the light source into an NRZ optical signal according to said NRZ electrical signal by providing a Non-Return to Zero (NRZ) optical signal generating section (column 7, line 3-30); and

(c) receiving said NRZ electrical signal (Optical Phase Modulator 3 receives NRZ electrical signal, Figures 8, 13 and 23) and modulating said NRZ optical signal into a

duobinary optical signal by a duobinary optical signal generating section signal (column 7, line 10-30).

8). With regard to claim 16, Ono et al further discloses wherein the light source used in step (a) comprises a laser diode (Semiconductor Laser 1 in Figure 8, 13 and 23).

9). With regard to claim 17, Ono et al further discloses wherein the NRZ optical signal generating section used in step (b) comprises a pair of first modulator driving amplifiers (Driving amplifiers 21 in Figure 15) for amplifying and outputting the NRZ electrical signal, and a first interferometer type optical intensity modulator (Optical Intensity Modulator in Figures 8, 13, 15 and 23) for modulating an intensity of said optical carrier according to driving signals inputted from said pair of first modulator driving amplifiers.

10). With regard to claim 18, Ono et al further discloses wherein said first interferometer type optical intensity modulator comprises a Mach-Zehnder interference type optical phase modulator (Mach-Zehnder (MZ) Optical Intensity Modulator, column 7 line 4-5).

11). With regard to claim 20, Ono et al further discloses wherein the **NRZ optical signal generating section** in step (b) is adapted for receiving the NRZ electrical signal from a pulse pattern generator without using a precoder for encoding and without the NRZ optical signal generator using low pass electrical filters to receive the NRZ electrical signal (Optical Intensity Modulator 2 receives an NRZ electrical signal without using a precoder for encoding and without the low pass electrical fitlers, Figures 8, 13

and 23; note: the precoder 7 of Figures 8, 12 and 23 is for the **duobinary optical signal generating section**).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 5, 7, 9-13 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ono et al (US 6,388,786), and in view of Kitajima et al (US 5,515,196) and Kaiser et al (Kaiser et al, "Reduced Complexity Optical Duobinary 10-Gb/s Transmitter Setup Resulting in an Increased Transmission Distance", IEEE *Photonics Technology Letters, Vol. 13, No. 8, August 2001, pages 884-886*).

1). With regard to claim 5, Ono et al discloses all of the subject matter as applied to claim 1 above. And Ono et al teaches wherein the duobinary optical generating section comprises a precoder (precoder 7 in Figures 3, 13, 15 and 23) for receiving the inputted NRZ electrical signal; a pair of second amplifiers (Driving amplifiers 21 in Figure 15) for amplifying and outputting the signal from the precoder; and a second interference type optical phase modulator (Optical Phase Modulator 3 in Figures 8, 13, 15 and 23) for modulating a phase of said NRZ optical signal according to driving signals from said pair of second amplifiers;

But, Ono et al teaches a precoder for processing the NRZ ectrical signal, Ono et al does not disclose a T-flip-flop for separating by odd or even positions a group of bits in the inputted NRZ electrical signal and the pair of second amplifiers for amplifying and outputting the signal from the T flip-flop.

However, the T flip-flop circuit has been widely used in the art to precode or encode the inputted signal. Kitajima et al, in the same field of endeavor, teaches a T-flip-flop (Figure 8, column 9, line 55 to column 10 line 5) for separating by odd or even positions a group of bits in the inputted NRZ electrical signal (Figure 8); and another prior art, Kaiser et al, discloses that by a toggle flip-flop (T-FF), no external feedback is required since the recurson is an integral functionl of the T-FF, and the T-FF structure using only feed forward building blocks avoids all problems with implementation and adjustment. Besides, an upgrade to higher bit rates of a single-chip integration can be done straightforwardly.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the T-FF as taught by Kitajima et al and Kaiser et al to the system of Ono et al so that a simple structure T-FF without feedback tap can be obtained, and an upgrade to higher bit rates of a single-chip integration can be made easier.

2). With regard to claim 7, Ono et al and Kitajima et al and Kaiser et al disclose all of the subject matter as applied to claims 1 and 6 above. And Ono et al further discloses wherein the apparatus does not require a precoder for encoding the NRZ electrical signal received from the pulse pattern generator (claim 7 depends on claim 6

NRZ optical signal generating section, Optical Intensity Modulator 2 receives the NRZ electrical signal without using a precoder for encoding and without the low pass electrical filters, see Figures 8, 13 and 23; note: the precoder 7 of Figures 8, 13 and 23 is for the **duobinary optical signal generating section**).

3). With regard to claim 9, Ono et al further discloses a duobinary optical transmission apparatus comprising:

a light source (Semiconductor Laser 1 in Figure 8, 13, 15 and 23) for outputting an optical carrier;

a first modulator driving amplifier unit (Driving amplifiers 21 in Figure 15) for receiving, amplifying, and then outputting at least one NRZ electrical signal;

an optical intensity modulator(Optical Intensity Modulator in Figures 8, 13, 15 and 23) for modulating the intensity of the optical carrier according to a driving signal inputted from the first modulator driving amplifier unit;

a precoder (precoder 7 in Figures 3, 13, 15 and 23) for receiving the inputted NRZ electrical signal.

a second modulator driving amplifier unit (Driving amplifiers 21 in Figure 15) for amplifying and outputting at least one signal outputted from the precoder; and

an optical phase modulator (Optical Phase Modulator 3 in Figures 8, 13, 15 and 23) for modulating the phase of the NRZ optical signal according to at least one driving signal transmitted from the second modulator driving amplifier unit.

But, Ono et al teaches a precoder for processing the NRZ ectrical signal, Ono et al does not disclose a T-flip-flop for separating by odd or even positions a group of bits

in the inputted NRZ electrical signal and the pair of second amplifiers for amplifying and outputting the signal from the T flip-flop.

However, the T flip-flop circuit has been widely used in the art to precode or encode the inputted signal. Kitajima et al, in the same field of endeavor, teaches a T-flip-flop (Figure 8, column 9, line 55 to column 10 line 5) for separating by odd or even positions a group of bits in the inputted NRZ electrical signal (Figure 8); and another prior art, Kaiser et al, discloses that by a toggle flip-flop (T-FF), no external feedback is required since the recurson is an integral functionl of the T-FF, and the T-FF structure using only feed forward building blocks avoids all problems with implementation and adjustment. Besides, an upgrade to higher bit rates of a single-chip integration can be done straightforwardly.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the T-FF as taught by Kitajima et al and Kaiser et al to the system of Ono et al so that a simple structure T-FF without feedback tap can be obtained, and an upgrade to higher bit rates of a single-chip integration can be made easier.

4). With regard to claim 10, Ono et al and Kitajima et al and Kaiser et al disclose all of the subject matter as applied to claim 9 above. And Ono et al further discloses wherein each of the optical intensity modulator and the optical phase modulator comprises a Mach-Zehnder interferometer type optical modulator (Mach-Zehnder (MZ) Modulator, column 7 line 4-7).

5). With regard to claim 11, Ono et al and Kitajima et al and Kaiser et al disclose all of the subject matter as applied to claims 9 and 10 above. And Ono et al further discloses wherein the Mach-Zehnder interferometer type optical modulator is a dual-armed Z-cut Mach-Zehnder interferometer type optical modulator (Figure 15, the dual-armed Z-cut MZ modulators are used).

6). With regard to claim 12, Ono et al and Kitajima et al and Kaiser et al disclose all of the subject matter as applied to claims 9-11 above. And Ono et al further discloses wherein each of the first and second modulator driving amplifier units includes a pair of modulator driving amplifiers (Driving amplifiers 21 in Figure 15), each of which amplifies the NRZ electrical signal inputted to itself.

7). With regard to claim 13, Ono et al and Kitajima et al and Kaiser et al disclose all of the subject matter as applied to claims 9 and 10 above. And Ono et al further discloses wherein the Mach-Zehnder interferometer type optical modulator is a single-armed X-cut Mach-Zehnder interferometer type optical modulator (e.g., Figure 8, the Mach-Zehnder modulator is the LN X-cut single-armed modulator).

8). With regard to claim 19, Ono et al discloses all of the subject matter as applied to claim 15 above. And Ono et al teaches wherein the duobinary optical generating section used in step (c) comprises a precoder (precoder 7 in Figures 3, 13, 15 and 23) for receiving the inputted NRZ electrical signal; a pair of second amplifiers (Driving amplifiers 21 in Figure 15) for amplifying and outputting the signal from the precoder; and a second interference type optical phase modulator (Optical Phase

Modulator 3 in Figures 8, 13, 15 and 23) for modulating a phase of said NRZ optical signal according to driving signals from said pair of second amplifiers;

But, Ono et al teaches a precoder for processing the NRZ ectrical signal, Ono et al does not disclose a T-flip-flop for separating by odd or even positions a group of bits in the inputted NRZ electrical signal and the pair of second amplifiers for amplifying and outputting the signal from the T flip-flop.

However, the T flip-flop circuit has been widely used in the art to precode or encode the inputted signal. Kitajima et al, in the same field of endeavor, teaches a T-flip-flop (Figure 8, column 9, line 55 to column 10 line 5) for separating by odd or even positions a group of bits in the inputted NRZ electrical signal (Figure 8); and another prior art, Kaiser et al, discloses that by a toggle flip-flop (T-FF), no external feedback is required since the recurson is an integral functionl of the T-FF, and the T-FF structure using only feed forward building blocks avoids all problems with implementation and adjustment. Besides, an upgrade to higher bit rates of a single-chip integration can be done straightforwardly.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the T-FF as taught by Kitajima et al and Kaiser et al to the system of Ono et al so that a simple structure T-FF without feedback tap can be obtained, and an upgrade to higher bit rates of a single-chip integration can be made easier.

7. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ono et al (US 6,388,786) and Kitajima et al (US 5,515,196) and Kaiser et al (Kaiser et al,

"Reduced Complexity Optical Duobinary 10-Gb/s Transmitter Setup Resulting in an Increased Transmission Distance", IEEE *Photonics Technology Letters, Vol. 13, No. 8, August 2001, pages 884-886*) as applied to claim 9 above, and in further view of Yonenaga et al (US 5,543,952).

Ono et al and Kitajima et al and Kaiser et al disclose all of the subject matter as applied to claim 9 above. But, Ono et al does not expressly state wherein the group of `1` in odd positions in the sequence and the group of `1` in even positions in the sequence, which have been separated from the NRZ electrical signal, respectively, have a phase difference of with respect to each other.

However, it is the fundamental requirement to make the group of `1` in odd positions in the sequence and the group of `1` in even positions in the sequence have a phase difference of with respect to each other so to obtain the duobianry signal. Yonenaga et al, in the same field of endeavor, discloses a duobinary signal generator using an optical intensity modulator and an optical phase modulator (Figure 11A). Yonenaga et al teaches wherein the group of `1` in odd positions in the sequence and the group of `1` in even positions in the sequence, which have been separated from the NRZ electrical signal, respectively, have a phase difference of with respect to each other (Figure 12F; e.g., the '1' on the left side of the second '0' has a π phase and the '1' on the right side of the second '0' has a zero phase; Figure 3 also show a π phase different of the '1's on the two side of the '0').

Yonenaga et al provide an optical transmission system with high transmission rate and long distance using a duobinary signal, and narrowing spectrum bandwidth to

half of that of a prior system, without deterioration of receiver sensitivity and with simple configuration of a receiver. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the modulation and coding method as taught by Yonenaga to the system of Ono et al and Kitajima et al and Kaiser et al so that a duobinary signal with narrow spectrum bandwidth can be obtained, and the tolerance to the chromatic dispersion can be improved.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Miyamoto (US 6,559,996) discloses a duobinary generator using an intensity modulator and a phase modulator (Figures 26 and 27).

Kahn et al (US 6,592,274) discloses a duobinary transmitter with an intensity modulator and a phase modulator.

Wei et al (US 2002/0196508) discloses an optical signal with a phase modulator and a T-FF precoder.

Ikeuchi (US 2003/0185575) discloses an drive control apparatus and method for optical modulator with a T-FF.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Li Liu whose telephone number is (571)270-1084. The examiner can normally be reached on Mon-Fri, 8:00 am - 5:30 pm, alternating Fri off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Vanderpuye can be reached on (571)272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Li Liu
March 10, 2007

KENNETH VANDERPUYE
SUPERVISORY PATENT EXAMINER